



DEPARTMENT OF NATURAL RESOURCES  
WATER PROTECTION PROGRAM  
WATER QUALITY MONITORING AND ASSESSMENT SECTION  
WATERSHED INFORMATION SHEET

## Nodaway River Basin-10240010

### Basin Description

The upper two-thirds of the Nodaway River basin lies in southern Iowa and the lower one third of the basin in northwestern Missouri. In Missouri, the Nodaway River flows almost due south to its confluence with the Missouri River about 12 miles northwest of St. Joseph. The Missouri portion of the basin has an area of 567 square miles. The major tributaries include Clear, Elkhorn and Mill creeks. The largest reservoir in the basin is Bilby Ranch Lake with a surface area of 110 acres. There are no public drinking water reservoirs in this basin.

Average annual rainfall ranges is 36 inches. Stream flow statistics for the basin are shown in Table 1.

Table 1. Stream Flow Statistics for Upper Grand River Basin

Stream/Location	Wtrshd. Area (sq.mi.)	Period Of Record	Flow (cfs)				
			90 <sup>th</sup> Percentile *	Mean	Median **	10 <sup>th</sup> Percentile ***	7Q10 Low Flow+
Nodaway R. @Graham	1,380	1982-2004	2,100	891	327	60	
Nodaway R. @ Oregon		Partial: 1940s & 60s					8.0

\*Flow is less than this amount 90 percent of the time

\*\*Flow is less than this amount 50 percent of the time

\*\*\*Flow is less than this amount 10 percent of the time

+ The lowest average seven consecutive day flow that occurs with a recurrence interval of 10 years.

The Nodaway River basin lies within the Deep Loess Hills portion of the Dissected Till Plains physiographic province. The land is a mixture of hills and plains. Sixty-five percent of the land is row crop, 28 percent is pasture and hay fields and 6 percent forest.

Except for limited areas where streams may have incised Pennsylvanian aged rock, the surface of the basin is glacial till overlain by loess. Glacial till is a mostly unsorted mixture of clay, sand, gravel and rock debris created and pushed southward into Missouri by the great glacial ice sheets. Loess is a windblown silt deposit. Depth of the till is highly variable but is generally less than 200 feet. Loess deposits in northwestern Missouri are the deepest in the state and run from 10 to more than 30 feet in depth. Cyclical (repetitive) deposits of sandstone, siltstone, shale, limestone and coal of Pennsylvanian age underlie these glacial deposits.

The presence of the clayey till and the underlying shale and coal beds ensure that there is very little movement of water to the subsurface. Most water movement in the basin is through the surface stream network. Water that reaches the subsurface will resurface locally when a stream valley incises a confining aquatard (an impermeable layer). There are eight small springs of note in basin, only one of which, Hazlett Spring, produces more than 10 gallons per minute. None of the springs sustain flow during dry weather. Since very little water infiltrates to the subsurface, streamflow can be very high during wet weather. For the same reason, base flows, streamflow sustained only by the re-emergence of groundwater into the stream, are very low during the intervening dry periods.

## **Water Quality Concerns**

Acceptable water quality is defined by Missouri's Water Quality Standards [<http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-7a.pdf>] . Streams or lakes that do not meet these standards are considered "impaired." They may not be fit for certain uses such as swimming, drinking water supply or protection of fish and other aquatic life. Waters are considered to be "affected" rather than "impaired" if water quality changes are less serious and state standards are not exceeded. These standards also list more than 3,600 classified streams and more than 400 classified lakes in the state. A classified stream is one that is either a permanently flowing stream or one that may stop flowing in dry weather but still maintains large pools of water that support aquatic life. Unclassified streams are small tributaries to classified streams. They typically have flowing water only during wet weather and are dry for the remainder of the year.

### **Water Quality in Prairie Streams**

<http://www.dnr.mo.gov/env/wpp/watersheds/info/wq-prairie-str.pdf>

### **Aquatic Habitat in Prairie Streams**

<http://www.dnr.mo.gov/env/wpp/watersheds/info/aquatic-hab-prairie-str.pdf>

## **Point Source Pollution**

Point source pollution is a discharge of wastewater from a single location such as a wastewater treatment plant. Wastewater treatment plants can serve industries, small businesses, subdivisions, mobile home parks, apartment complexes, or entire cities. Wastewater from residential sources such as subdivisions, apartments and mobile home parks is often referred to as "domestic wastewater." It primarily contains treated human wastes, food wastes and detergents. The primary pollutants of concern in domestic wastewater are the amount of organic matter, which is commonly reported as Biological Oxygen Demand (BOD), suspended solids and ammonia. Industrial and commercial wastewater can be more complex and may contain, in addition to domestic wastes, heavy metals or man-made organic chemicals that can be potentially toxic. Discharges from most municipal wastewater treatment plants are usually a mixture of domestic and industrial/commercial wastewater. Most wastewater plant discharges are also typically

high in nitrogen and phosphorus, two elements that act as fertilizers and can cause excessive algae growth in waters receiving these discharges.

There are eight permitted domestic or industrial/commercial point sources that discharge a combined 0.20 million gallons per day (mgd) of treated wastewater into the waters of the Nodaway River basin. There are 178 miles of classified streams in the basin, none of which is known to be affected or impaired by point source wastewater discharges. There are also no known impacts from wastewater discharges to unclassified streams in the basin.

#### Wastewater Treatment

<http://www.dnr.mo.gov/env/wpp/watersheds/info/wastewater-treatment.pdf>

### **Nonpoint Source Pollution**

Nonpoint source pollution occurs when pollutants enter bodies of water at points that are not well-defined and stable. Examples include the erosion of sediments or the entrance of polluted surface runoff or groundwater into lakes and streams. Locations of nonpoint source pollution are often widely dispersed and are difficult to identify or control. In the Nodaway River basin, the most serious nonpoint problem is degradation of aquatic habitat. A total of 178 miles (100 percent) of classified streams in the basin are considered to have degraded aquatic habitat. The prevalence of highly erosive loess soils and the large amount of row crop agriculture in the basin result in some of the highest soil erosion rates in Missouri and high levels of sediment deposition in streams. The quality of aquatic habitat is further impaired by removal of wooded riparian vegetation, and by the channelization, or straightening, of streams. Channelization has occurred in 42.5 miles (24 percent) of streams in the basin.

Storm water runoff in the Midwest can also carry significant amounts of fertilizers, animal wastes, and pesticides into streams.

Groundwater can also be affected by nonpoint source pollution. In northern and western Missouri, some public water supplies and many private water supplies come from groundwater. Public groundwater supplies are routinely tested. Some public wells serving Maitland and Clearmont had to be relocated several years ago when tests showed chronic problems with high levels of nitrate. Studies of water quality of private wells in northern and western Missouri show that about one third of wells exceed the drinking water standard for nitrate. And about 2 percent exceed drinking water standards for pesticides. This contamination is often caused by local land use practices or surface contamination of the wellhead and does not represent widespread contamination of the underground aquifer. Deeper aquifers are protected from surface contamination by impermeable strata.

During warm weather when stream flows are low, livestock tend to gather in and around streams. The wastes they leave in the water contribute to nuisance algae growths, low levels of dissolved oxygen and elevated levels of ammonia and bacteria.

## Water Quality Management

The department achieves water quality management of point source pollutants through the issuance and enforcement of wastewater discharge permits. These permits limit the amount of pollutants that can be discharged. All point source wastewater dischargers must obtain a permit and adhere to its discharge limitations. All permits require at least a level of treatment equal to national wastewater treatment standards. In situations where these national treatment standards are not adequate to protect the streams or lakes receiving these wastewater discharges, stricter permit limits that do protect these waters are required. The permits require regular monitoring and reporting of discharge quality. The department also conducts regular inspection of wastewater treatment facilities and receiving waters.

Nonpoint source pollution is addressed through the state's nonpoint source management plan. This plan is a cooperative program between the Department of Natural Resources and other federal, state and local government agencies or organizations, local landowners and other interested citizens. The plan emphasizes addressing problems at the watershed level through the use of management practices that control nonpoint pollution. The most commonly supported practices are those that control soil erosion on agricultural and urban lands, improve quality and quantity of forage on grazing lands, protect riparian zones, and those that control runoff of animal manures, fertilizers and pesticides. The state nonpoint source management plan is a voluntary program that provides funds to help defray the cost of adopting management practices.

Since 1990, there have been seven nonpoint source watershed projects in the basin. These projects have been funded by state sales tax money earmarked for soil and water conservation. These projects treated more than 15,800 acres of land, comprising about 4 percent of the entire basin.

Table 3. Nonpoint Source Watershed Projects in the Nodaway River Basin

Watershed Name	County	Project Date	Watershed Size (Acres)	Acres Treated	Percent of Watershed Treated
Upper Lincoln Cr.	Andrew	1991-95	7,835	2,847	36%
Jenkins Cr.	Nodaway	1991-95	5,400	3,045	56%
Lower Pedlar Cr.	Andrew	1991-95	3,989	1,908	48%
Nichols Cr.	Holt	1993-97	4,338	2,022	47%
Hickory Cr.	Holt	1995-99	5,921	2,192	37%
E. Branch Jenkins Cr.	Nodaway	1995-99	3,784	1,949	52%
E. Branch Elkhorn Cr.	Nodaway	1995-99	5,340	1,843	35%

The Missouri Department of Natural Resources monitors water chemistry and aquatic invertebrate communities at many locations in Missouri. The department also tracks the quality of domestic, industrial and storm water discharges. These monitoring activities provide information on water quality problems, such as their specific location, pollutants, sources and possible solutions. This information guides the management activities the department takes to protect water quality in Missouri.

### **Web links**

US Geological Survey

<http://mo.water.usgs.gov/>

Kansas City District Corps of Engineers

<http://www.nwk.usace.army.mil/>

Missouri Department of Conservation

<http://www.mdc.mo.gov/fish/watershed/nodaway/contents/280cotxt.htm>

US Environmental Protection Agency

<http://www.epa.gov/region7/water/index.htm>